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WARNING

Because of possible shock or fire hazards, connection of this instrument should be performed in compliance with the National Electric Code (ANSI C1) or any other requirements, or both, which may be applicable to the user.

Installation, operation, and maintenance should only be performed by qualified personnel.

TM-111900-1

VOLUME 1 -- OPERATOR'S MANUAL

626-PA-6012A

COMMUNICATIONS MODULE

15 June 1985
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(Rev. B)

See opposite side relative to proprietary rights

Note: Refer to Volume 2 (Service Manual) TM-111900 for maintenance information.

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VOLUME 1
OPERATOR'S MANUAL

626-PA-6012A COMMUNICATIONS MODULE

SECTION I
GENERAL INFORMATION

1.1 SCOPE

This manual consists of two volumes. Volume 1, the Operator's manual, is divided into three sections: I) GENERAL INFORMATION, II) INSTALLATION AND OPERATION, and III) OPERATIONAL TEST. Volume 2, the Service manual, contains the maintenance instructions and consists of four sections, IV through VII. (See Volume 2 for a description of these sections.)

1.2 INTRODUCTION

This manual provides the installation and operating instructions for the 626-PA-6012A Communications Module plug-in, referred to as the 6012A plug-in. The 6012A plug-in is designed for installation into the Series 626 Universal Disturbance Analyzer Mainframe, referred to as the Series 626. Before reading these instructions, you should be familiar with the Mainframe information described in Volume 1 of the Mainframe manual.

1.3 APPLICATIONS AND PURPOSE

The 6012A plug-in is a bi-directional interface module used for remote operation of the Series 626 via telephone lines. It provides storage in its own stack memory for up to 960 disturbance events outputted from the Series 626 communications port. It then re-transmits the data to your terminal or printer, on demand, or at programmed time intervals, via its built-in, auto-answer/auto-dial modem. The 6012A plug-in also automatically answers incoming telephone calls for data requests.

After log-on, the 6012A plug-in transparently receives your commands via the telephone lines. It then passes your command directly to the Series 626, via the communications port interface, where it is processed. The output data is then immediately transmitted back to the 6012A plug-in, and then to you, through the telephone lines.

The 6012A plug-in may be programmed to immediately transmit upon the occurrence of any event, whenever an operator (on-site or remote) requests a transmission, on a periodic basis every X hours, or when memory is nearly full. A rear panel LED indicates data transmission activity.

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1.4 PHYSICAL CONFIGURATION

The 6012A plug-in is a single width module: 6½" high by 1¼" wide by 10" deep. It is designed for installation into any one of the five slots of the Series 626 Mainframe.

NOTE

It is preferable to use slot #1 to avoid entangling the signal input lines with the communications lines.

The 6012A plug-in is connected to the Series 626 RS-232C communications port via a 626/6012A interface cable (Dranetz Part # 110540). The 6012A plug-in is connected to a telephone line via a standard RJ-11C jack on its rear panel. A red LED on the rear panel lights whenever the telephone line is active (OFF-HOOK).

The module consists of three PC boards:

a. Board **#1** is a CPU/Module interface board. It contains the 6012A plug-in's CPU, modem control, RS-232C interface, Series 626 module interface circuitry, and the stack memory (32K of CMOS RAM).

b. Board **#2** contains additional modem interface circuitry.

c. Board **#3** is an FCC registered, full duplex, 300-baud modem.

1.5 TECHNICAL SPECIFICATIONS

The technical specifications for the 6012A plug-in are listed in Table 1-1 which begins on the following page. The major sections of Table 1-1 are as follows:

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Table 1-1. Technical Specifications (page 1 of 9)

I. MEMORY

A. Size: 32 kilobytes max

B. Type: CMOS RAM

C. Allocation:

1. CPU: 1 kilobyte (Includes a 16-byte IRQ stack, and two 112-byte buffers for remote Receiver Mode buffering)

2. DATA STACK: 30 kilobytes

3. RE-TRANSMIT STACK: 1 kilobyte

D. Typical Event Capacity: 960 @ 32 characters/event

II. COMMUNICATIONS PORT (RS-232C COMM PORT)

A. Type: RS-232C compatible (DTE configuration)

B. Connection: To the Series 626 communications port via the interface cable (P/N 110540)

C. Baud Rate: Derived from the transmit/receive clock (pin 17) of the Series 626 communications port

D. Data Processing:

1. Received from the Series 626's communications port on an interrupt basis

2. Transmitted to the Series 626's communications port on a non-interrupt basis

III. TELEPHONE PORT

A. Type: Standard, -9dB permissive, 2-wire telephone line

B. Connection: Standard RJ-11C telephone jack

C. Status Indicator: Red LED on the rear panel lights whenever the port is active

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Table 1-1. Technical Specifications (page 2 of 9)

IV. MODEM

A. Baud Rate: 0 to 300 asynchronous

B. Type: Bell 103 compatible, full duplex

C. Modulation: Binary, FSK

D. FCC Registration Number: DRJ6YR-70737-DM-N

E. Ringer Equivalence: 0.2B

F. Data Processing:

1. Received from the telephone line on a non-interrupt basis

2. Sent over the telephone line on an interrupt basis when the stack data is being transmitted; sent on a non-interrupt basis when in the Receiver Mode

G. Transmitter:

1. Transmit Frequency:

a. Originate: Mark: 1270 Hz ±1%
Space: 1070 Hz ±1%

b. Answer: Mark: 2225 Hz ±1%
Space: 2025 Hz ±1%

2. Receiver Level: -9dBm permissive

3. Clear to Send Delay:

a. Originate: 300 ±45 msec from CD

b. Answer: Coincidental with carrier detect

4. Answer Tone Timing: 2.56 ±0.5 sec

5. Soft Carrier Turn Off: 26.6 ±5 msec

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Table 1-1. Technical Specifications (page 3 of 9)

H. Receiver:

1. Receive Frequency:

a. Originate: Mark: 2225 Hz ±1%
Space: 2025 Hz ±1%

b. Answer: Mark: 1270 Hz ±1%
Space: 1070 Hz ±1%

2. Receiver Sensitivity: -8dB to -45dB

3. Carrier Dropout: -45dB ±3dB

4. Carrier Detect Delay:

a. ON: 150 mSec ±30 msec

b. OFF: 50 mSec ±10 msec

5. Hysteresis: 2dB, min

V. CPU/INTERFACE BOARD

A. Processor Type: 6502

B. Power Consumption:

1. +12 V dc = 22 mA typical

2. -12 V dc = 12 mA typical

3. +5 V dc = 100 mA typical

C. Dialer Section:

1. Type: pulse

2. Rate: 10 pulses/second, max

3. Make/Break Ratio (Jumper Selectable):

a. 61% low, 39% high

b. 67% low, 33% high

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Table 1-1. Technical Specifications (page 4 of 9)

4. Interdigit Timing (Jumper Selectable):

   a. 300 msec

   b. 800 msec

5. Digit Capacity: 16, including the WAIT-FOR-DIAL-TONE character

6. Maximum Wait Time for Dial Tone: 1.8 sec typical

7. Time to Dial: Depends on the telephone number and length

8. Maximum Retries if Call not Completed: 128

9. Wait Time Between Retries: 2 sec typical

10. Wait Time for Answer Back Tone (ABT) to Begin: 12 seconds

D. System Check Test:

1. Checks the memory size by writing to it and then reading back a series of test characters

2. Checks the RS-232C port control lines

3. Checks the modem by looping back the transmitter to the receiver, and writing and reading back a series of test characters

VI. DATA TRANSMISSION PROCEDURE

A. Call Initiation Procedure:

1. Enables DTR and Dial Enable

2. Waits max of 1.8 sec for dial tone

3. Dials digits

4. Upon completion of a successful dial, DSR turns on

5. 2-second billing time

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Table 1-1. Technical Specifications (page 5 of 9)

6. 3-second Answer Back Tone (ABT)

7. RTS turns on, waits for CTS

8. Sends "STATION #XX" message before beginning the transmission of data

B. Block Length:

1. Length: 1024 characters

2. Time/Block: 40 sec typical

3. Output Format: 1 start bit, 7 bits ASCII data, even parity, and 2 stop bits

4. Overrun Character: $

C. Re-transmit Conditions:

1. Checks For:

a. Negative Acknowledge "^U" (NAK)

b. Positive Acknowledge "^F" (ACK)

c. End of Transmission "^D" (EOT)

2. Max Wait Time: 10 sec

3. Max Re-Transmit Requests: Infinite

D. Call Answering Procedure:

1. Enables DTR on detection of a ring

2. Waits 2 sec for the billing time

3. Turns RTS on

4. Checks for DSR to turn on (max 0.75 sec)

5. Waits for DCD to be activated (max 7 sec)

6. Checks for CTS and transmitter empty (max 1 sec)

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Table 1-1. Technical Specifications (page 6 of 9)

7. Waits 1 sec and sends "?"

8. Waits for "IDXX": Where XX is the Station ID (max 16 sec)

NOTE

Failure of step 5, 6, or 8 results in a hang up (ON-HOOK). Failure of step 4 results in a "MODEM DEAD" message.

9. Waits 1 sec and sends "XX-READY" message

E. Call Termination Conditions:

1. If the modem fails to pass the System Check

2. When attempting to call out and there is no Answer Back Tone (ABT) within the specified time

3. If finished transmitting stack data and not in Receiver Suspended (Sends "BYE")

4. If the modem status is deemed inoperable

5. If in Receiver Mode and DSR falls, or DCD is gone for more than 2.5 sec

6. CPU massive failure

F. Data Transmission Protocol:

1. Comparable to ISO 1745 except:

   a. When in Receiver Mode, operates transparently, full duplex--Series 626 protocol followed

   b. When in wait loop, if the timer times out, instead of re-transmitting the block, the next block of data is transmitted

2. Control characters sent out of the Series 626 for data transmission are suppressed and only inserted according to ISO 1745

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Table 1-1. Technical Specifications (page 7 of 9)

3. Typical Transmission Format:

SOH/"STATION#xx"/STX/data (1k)/ETB/--wait time--/
STX/data/ETB/...../STX/ last block of data /ETX/
"END OF XMIT"/--wait time--/"BYE"/DLE/EOT
(call terminated)

During wait time, looks for:

ACK: Positive Acknowledge
NAK: Negative Acknowledge
EOT: Terminate Call, End of Transmission

VII. PROGRAMMABLE FEATURES

A. Stack Memory Dump Modes:

1. NEVER --Holds all data regardless of the stack conditions

2. STACK FULL --Transmits data when only 200 free bytes of the stack remain

3. EVERY EVENT --Transmits each time any data goes into the stack

4. UPON REQUEST --Transmits only when given the proper command by the user while in the Program Mode, or from the remote location (Immediate Transmit Mode)

5. EVERY X HOURS --Transmits the stack data every X hours (where X is a value from 01 to 99)

6. EVERY X HOURS W/ STK FLL OPT --Every X hours with the Stack Full Option (same as 2 and 5)

B. Telephone Number:

1. Max of 16 digits, including the WAIT-FOR-DIAL-TONE character (":" Key)

C. Station ID:

1. Min # = 00

2. Max # = 99

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Table 1-1. Technical Specifications (page 8 of 9)

D. Preset Values:

1. Transmit Mode: UPON REQUEST
2. Telephone Number: 238
3. Station ID: 00

VIII. OPERATIONAL DISTURBANCE MESSAGES

A. Possible Events:

1. PHONE LINE DEAD	--Telephone line goes dead while the modem is active or an improper call termination procedure is used
2. RS-232C PORT DEAD	--DSR or CTS bad, or transmitter or receiver will not clear
3. MODEM DEAD	--Modem turned off due to a self-test failure during the System Check, or DSR fails, or the transmitter fails to empty when DCD and CTS are valid
4. OVFLW STK OVFLW	--Overflow Stack overflowed--stack memory full, data possibly lost ($ char will show up in the dump)
5. MODEM BUSY	--Transmitter busy--request for System Check but the modem is active so the test cannot be done
6. RAM MEM DEAD	--CPU RAM massive failure--insufficient RAM to permit continued proper operation--6012A CPU is shut down
7. NO CALL-128 TRY	--Cannot complete connection after 128 attempts, transmit request is cleared
8. RCV BUFFR OVFLW	--Receiver buffer overflow--receiver buffer for remotely received characters is full

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Table 1-1. Technical Specifications (page 9 of 9)

9. NO DIAL TONE	--During an attempted phone call, if no dial tone is detected, the call sequence is terminated
10. DSR 626:OFF	--RS-232C port is inoperable due to the loss of DSR from the Series 626 communications port
11. DSR 626:ON	--RS-232C port is restored upon restoration of DSR from the Series 626 communications port
12. IRQ STK OVFLW	--IRQ stack overflowed--possible loss of "disturbance" data from 6012A CPU to module interface
13. PHONE CALL IN	--Modem received call (remote access via telephone lines)
14. PHONE CALL OUT	--Made a successful call out
15. PHONE CALL DONE	--Modem ends call (hangs up) following proper call termination procedure: sends "BYE" followed by DLE (Data Link Escape) and EOT (End of Transmission)

B. Format:

(1)

C. Short Term Accumulator:

1. Summary Mode event printout is the same as above, except no time data is shown

IX. REMOTE COMMAND SUMMARY

Command	Description	Abbreviation	ASCII	
Ctrl-D	Terminates connection	(EOT)	$04	
Ctrl-U	Retransmits block	(NAK)	$15	
Ctrl-F	Transmits next block	(ACK)	$06	
¦	Dump stack command		$7C	(2)
¦	Display stack command		$21	

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1.6 FUNCTIONAL DESCRIPTION

The following subsections provide a functional description of the 6012A plug-in and its connection to the telephone lines.

1.6.1 RS-232C Port Connections

The 6012A plug-in's RS-232C compatible communications port, referred to as the COMM PORT, is connected to the Series 626's RS-232C communications port via an interface cable (P/N 110540).

1.6.1.1 RS-232C Port Configurations

The 6012A plug-in's COMM PORT is configured as a DTE (Data Terminal Equipment); the Series 626's port is a DCE (Data Communications Equipment). The 6012A plug-in monitors the DSR (Data-Set-Ready) and CTS (Clear-to-Send) lines from the Series 626. Any change of state of the DSR signal produces a disturbance printout. The CTS line is allowed to be "busy" (high) for up to 80 milliseconds. If it is "busy" for more than 80 milliseconds, it is flagged as an "RS-232C PORT DEAD" error.

The COMM PORT's baud rate is determined by the Xmit/Rcv Clk signal (pin 17) from the Series 626's communications port. Data sent to the 6012A plug-in is processed on an interrupt basis. It is stored in the RAM stack until it is re-transmitted or the memory is filled up. If any data is missed (e.g., the result of an overflow, or in the unlikely occurrence that the 6012A plug-in is not able to service the interrupt in time), a special character, "$", is stored in memory in place of the overrun character to indicate that data is missing.

1.6.2 Modem Port Connections

The 6012A plug-in interfaces to the public switched telephone network via an FCC registered modem. This connection is made via the RJ-11C (standard) PHONE JACK on the plug-in's rear panel using the supplied modular plug cable assembly (P/N 111919-G1).

1.6.2.1 Modem Port Communications

The 6012A plug-in calls the user-programmed telephone number after the Transmit Mode conditions have been met. The CPU instructs the modem to go OFF-HOOK and then checks for a dial tone. If it is not detected within three seconds, the modem goes back ON-HOOK and the "NO DIAL TONE" message is printed. If there is a dial tone, the telephone number is then dialed.

After dialing, the 6012A plug-in waits for the Answer Back Tone (ABT). If it is not detected within three seconds, the receiving end is either busy or not operating properly. In this case, the 6012A plug-in hangs up and then re-dials for up to 128 attempts. If the ABT is still not detected within these attempts, the message "NO CALL-128 TRIES" is printed; the call request is cleared until the user-programmed transmit condition re-occurs.

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If the telephone call and handshaking (connection verification) are successfully completed, the message "STATION#XX" is printed: where XX is the user-programmed identification number. (If there are multiple units calling a single location, this identifies which unit is calling in.) The message "PHONE CALL OUT" is also printed. The data is then transmitted in 1K blocks, using 11 bit ASCII format, in comparable ISO (International Standards Organization) 1745, by an interrupt-driven routine to allow for maximum throughput.

1.6.2.2 Completion of the Modem Data Transmission

When a block of data is completed or the end of the data is reached, the 6012A plug-in waits for up to ten seconds while looking for a positive acknowledge character (ACK), a negative acknowledge character (NAK), or the end of transmission character (EOT).

If a NAK character is received, the last block of data is re-transmitted; the plug-in then returns to the 10-second wait loop. If an ACK character is received, the plug-in leaves the wait loop and the next block of data is transmitted; the plug-in then returns to the 10-second wait loop. If an EOT character is received, the call is immediately terminated; the message "PHONE CALL DONE" is printed. If no character is received and the wait loop times out, the next block of data is transmitted. The process continues until all of the data has been transmitted.

After the final wait time has expired, the 6012A plug-in sends an "END OF XMIT" message and "BYE" over the telephone lines, along with the DLE (Data-Link-Escape) and EOT control characters. The telephone line is then disconnected and the "busy" status is cleared. The message "PHONE CALL DONE" is printed.

If the telephone link is broken or disturbed for more than 50 milliseconds, at any time, the call will be terminated and "PHONE LINE DEAD" will be printed. If this occurs, only the character being transmitted when the communications break occurred is lost.

1.6.2.3 Receiving an Incoming Call

If a call is received by the 6012A plug-in, it first turns the DTR line on, putting the telephone OFF-HOOK. At the end of the ring, the DSR line is automatically turned on. It then waits the required two seconds for the billing time, turns the RTS line on, and then sends an ABT. The 6012A plug-in waits up to 2.5 seconds for a Carrier Detect (DCD) signal. Once the carrier is established, the 6012A plug-in sends a "?" and waits for up to 16 seconds looking for the sequence "IDXX": where XX is the station identifier. If either the DCD or "IDXX" sequence is not received, the 6012A plug-in disconnects the telephone line. (This is done in order to deter unauthorized access to the unit by making it more difficult for someone [or something] to try to "guess" the access code.)

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If the proper characters are received, the 6012A plug-in waits one second and then sends the message "XX-READY". This informs you that the system is ready to receive data. The 6012A plug-in is placed in the Receiver Mode (transparent to the remote user). All data received from the remote end is sent to the Series 626's RS-232C communications port via a 112-character buffer. Characters outputted by the Series 626 during this time are stored in the stack memory (as usual), and are also transmitted over the telephone line via another 112-character buffer.

1.6.2.4 Prevention of Buffer Overflow

If the Series 626's baud rate is greater than 300, data is transmitted to the 6012A plug-in faster than it can be sent out over the telephone line. This causes the outgoing buffer to overflow, and the unit will appear to loose characters when on-line; however, all of the characters are stored in the 6012A plug-in's main memory.

NOTE

To prevent such overflow problems, set the baud rate of the Series 626 Mainframe to that of the 6012A plug-in (300 baud), if you intend to call up the unit and operate it remotely.

1.6.2.5 Post-Call Link Establishment

Once the link is established, the message "PHONE CALL IN" is printed. If the carrier drops for more than 2.5 seconds, the 6012A plug-in terminates the call and prints "PHONE LINE DEAD". When a call is properly terminated by an EOT character, "BYE" is sent over the telephone line and "PHONE CALL DONE" is printed, giving you a hard-copy record of all of the telephone activity.

Only two characters are intercepted by the 6012A plug-in: dump stack "¦" and display stack "!". If the dump stack character "¦" is received, a check is made to see if the unit is in the UPON REQUEST (Immediate Transmit) Mode. If not, a "NOGO" message is sent, followed by "BYE", the call is terminated, and "PHONE CALL DONE" is printed. (This deters unauthorized access to the data, for once transmitted, data is cleared from memory.) If the unit is in the UPON REQUEST (Immediate Transmit) Mode, the Receiver Mode is suspended until all stack data is transmitted as described above. After completion of the stack dump, the 6012A plug-in returns to the transparent Receiver Mode.

If the display stack character "!" is received, the plug-in displays the contents of the stack. Data is not lost when displayed, allowing multiple accesses of the available units. When the "!" is received, the plug-in sends a "DATA DISPLAY" message, followed by the stack data. When the stack display is completed, an "END OF XMIT" message is sent.

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The control characters available during the display sequence are as follows: Ctrl-C, $03 ETX (abort display); Ctrl-D, $04 EOT (hang up phone); Ctrl-S, $13 DC3 (halt a display); and Ctrl-Q, $11 DC1 (continue a halted display).

1.6.3 6012A Plug-In's CPU Communication

The 6012A plug-in's CPU communicates to the module interface software via a mailbox technique. Either software program may request control of the common RAM, provided the other side doesn't already have control. Simultaneous requests are prevented by clock phasing. Once a request is granted, RAM can be written to or read from. Data is passed between the 6012A plug-in's CPU and the module interface in this manner. To signal the other side that new data is there, or that certain data is requested, an IRQ line for each side may be set, and then cleared once the other side has acknowledged it. Since the CPU could generate interrupts faster than the module could process, the plug-in's 16-byte stack is used to send interrupts whenever possible. Any error conditions, data status requests, or program parameter changes are exchanged in this manner.

1.6.4 6012A Plug-In's System Check Routine

The 6012A plug-in's System Check routine checks the memory, RS-232C port (COMM PORT), and the modem port (PHONE JACK) status. To determine operational memory size, memory is swapped out and a series of test characters are written in, read back, and then compared. The status lines of the RS-232C port are then checked. The modem is checked by selecting a TEST line, which loops the output of the transmitter back to the receiver just behind the OFF-HOOK switch.

NOTE

The telephone line, telephone line interface, dialer circuitry, and OFF-HOOK switch are not tested during a System Check.

If the modem was previously turned off for any reason, successful completion of the System Check re-enables the modem. Any failure to successfully complete the System Check results in the modem being disabled and a "MODEM DEAD" message being printed.

1.6.5 6012A Plug-In's Module Interface Software

The 6012A plug-in's module software interfaces to the Series 626 CPU. It controls the Opertional Disturbance, Program, and System Check printouts, as well as the program routine for the user-programmable parameters. It runs independently of the 6012A plug-in's CPU program, except when a conflict for control of the common RAM exists, or when it is waiting for a data response from the 6012A plug-in's CPU software. Other than a slight delay of the Power-On sequence, the 6012A plug-in's presence is not noticable during normal Series 626 operation.

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1.7 STANDARD ACCESSORIES

Part #	Quantity	Description
TM-111900 Volume 1	1	Operator's manual
P/N 110540	1	626/6012A interface cable
P/N 111919-G1	1	25' (7.6m) telephone cord with RJ-11C jacks

1.8 OPTIONAL ACCESSORIES

Part #	Quantity	Description
TM-111900 Volume 2	1	Service (Maintenance) manual

1.9 FACTORY REPAIR

When factory repair is required, proceed as follows:

1. Contact Dranetz Customer Service Department to obtain an authorization number for factory repair:

   Telephone No: (201) 287-3680

   TWX: (710) 997-9553

   FAX: (201) 248-9240

   Telex: 499-7808

   Cable: DRANETZ

2. Fill out the REPAIR/SERVICE ORDER form enclosed in the Series 626 Operating manual. Ship it along with the malfunctioning equipment to the Dranetz Customer Service Department.

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SECTION II
INSTALLATION AND OPERATION

2.1 GENERAL

This section contains the installation, programming and operating instructions for the 6012A plug-in.

2.2 LOAD RATINGS

The Series 626 standard Mainframe has an upper limit of the combined total rating of its installed modules. The overall Mainframe capacity is set at 20 units. The individual modules (existing as of this printing) have the following load ratings:

Table 2-1. Load Ratings

Plug-in	Load Rating	Plug-in	Load Rating
626-PA-6001	2 Units	626-PA-60012A	3 Units
626-PA-6001 with Extra Option Board	3 Units	626-PA-6013	2 Units
		626-PA-6014	1 Unit
		626-PA-6015	4 Units
626-PA-6002	2 Units	626-PA-6018	4 Units
626-PA-6003	4 Units	626-PA-6020	4 Units
626-PA-6005	2 Units	626-PA-6024A	4 Units
626-PA-6006	2 Units	626-PA-6024B	4 Units
626-PA-6007	1 Unit	626-PA-6025	4 Units
626-PA-6008	2 Units	626-PA-6030	6 Units
626-PA-6009	4 Units	626-PA-6037	1 Unit
626-PA-6011	1 Unit	626-PA-6038	1 Unit
626-PA-6012	2 Units	626-PA-6040	6 Units

NOTE

When selecting modules for installation into any Series 626 Mainframe, verify that the sum of the load ratings of the installed modules DOES NOT exceed 20 Units.

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2.3 INSTALLATION

To install the 6012A plug-in into the Mainframe, proceed as follows:

WARNING

Be sure that the Series 626 Mainframe and all of the power connected to its plug-in modules are first turned OFF before proceeding with any installation.

1. Position the top and bottom front corners of the plug-in module into the upper and lower tracks of the desired slot position at the rear of the Series 626 Mainframe. (It is preferable to use slot #1--the fifth slot from the left when facing the rear panel.)

2. Carefully slide the module into the Mainframe until it is firmly in position.

3. Tighten the top and bottom captive screws in order to secure the module to the Mainframe.

2.3.1 Compliance with FCC Rules and Regulations

The modem described in this manual has been approved by the FCC (Federal Communications Commission) for direct connection to the Public Switched Telephone Network. To comply with FCC regulations, you must be aware of certain procedures and considerations regarding the installation and operation of registered terminal equipment.

The following subsections (2.3.1.1 through 2.3.1.6) are paraphrased from a list of FCC Specifications, Part 68.

2.3.1.1 Notification of the Telephone Company

Before connecting to the telephone network, notify your telephone company of the line that you are using, the FCC Registration Number, the Ringer Equivalence of the modem, and the type of jack required for the connection. (This information appears on the rear panel of the 6012A plug-in, but is also stated below for convenience.) You must also notify your telephone company upon final disconnection of the equipment.

FCC Registration Number: DRJ6YR-70737-DM-N
Ringer Equivalence: 0.2B
Phone Jack (USOC): RJ-11C

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2.3.1.2 Connection to the Telephone Network

All direct connection to the telephone network must be made through standard plugs and jacks as described in Part 68, Subpart F, of the FCC Rules. Connection to party lines and coin telephone service is prohibited.

After properly notifying the telephone company of your intended connection and installing the required jack, you may connect the modem by inserting the mating plug of the cable into the jack.

2.3.1.3 Responsibilities of the Telephone Company

The telephone company shall supply, upon request, the technical information required to permit compatibility with its facilities. To allow you the opportunity of maintaining uninterrupted service, the telephone company shall give you adequate notice of changes in its facilities and operations that may affect the use or performance of your equipment.

2.3.1.4 In Case of Trouble

If you experience operating trouble, disconnect the modem from the telephone line to determine if the equipment is malfunctioning. DO NOT use the modem until the problem is solved.

2.3.1.5 Incidence of Harm

If your modem causes harm to the telephone network, the telephone company shall, if feasible, notify you that service may be temporarily discontinued. If it becomes necessary to discontinue service immediately without prior notice, the telephone company shall promptly notify you and give you the opportunity to register a complaint to the Commission (FCC), pursuant to the procedures set forth in Part 68, Subpart E of the FCC Rules.

2.3.1.6 Service

All service and repairs must be performed by either Dranetz Technologies, Inc., or by the Dranetz Service Corporation. If unauthorized modification or repair is performed, both the FCC Registration and the manufacturer's warranty in effect will be null and void. If a malfunction is suspected, it is your responsibility to contact the Dranetz Service Corporation for further instructions.

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2.3.2 Connecting the 6012A Plug-In

The 6012A plug-in has two connectors on its rear panel. One is for connection to the Series 626 Mainframe, and the other is for connection to the telephone lines. To connect the plug-in, proceed as follows:

1. Connect one end of the 626/6012A interface cable (P/N 110540) to the 6012A plug-in's COMM PORT, and the other end to the Series 626's communications port.

NOTE

FCC regulations require you to contact the telephone company before connecting this unit to a telephone line. This informs them of your intent to connect an FCC-Registered modem to the telephone lines. You must provide the telephone company with the Registration Number and Ringer Equivalence for the built-in modem. These numbers are located on the 6012A plug-in's rear panel.

2. Plug one end of the telephone cord (P/N 111919-G1) into the standard RJ-11C jack on the 6012A plug-in's rear panel (labeled "PHONE JACK"), and the other end into your telephone jack.

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2.4 OPERATING CONTROLS AND INDICATORS

This subsection contains information on the Series 626's operating controls and indicators used by the 6012A plug-in.

The 6012A plug-in uses a menu-style format for selecting items. The functions of the Series 626's operating controls and indicators used by the 6012A plug-in are described in Table 2-2 below. Figure 2-1 on the following page illustrates the Series 626 controls used by the 6012A plug-in. For a description of the controls common to overall Series 626 operation, refer to Volume 1 of Series 626 Universal Disturbance Analyzer Operator's Manual.

Table 2-2. 6012A Plug-In Operating Controls

ITEM	FUNCTION
Numeric Keyboard*	Allows the selection of menu items
Numeric Keys	Used to enter numerical values for the various functions.
[DATA] push button	Produces a Data Summary printout when pressed.
[PROG] push button	Produces a Program Summary printout when pressed.
[PRESET] push button	With the FUNCTION key switch set at "PROGRAM", and a channel push button [1], [2], [3], [4], or [5] depressed, pressing [PRESET] recalls the "Factory Preset" program for that channel.
[ENTER] key	Transfers the numeric keyboard value into the 6012A plug-in's main memory when pressed.
[FNC] key	When pressed and then followed by a [1], [2], [3], or [4] key, the [FNC] key allows you to program the 1) telephone number, 2) transmit mode, 3) station ID, or 4) immediately transmit (respectively).
OTHER FRONT PANEL CONTROLS AND INDICATORS	Refer to Volume 1 of the Series 626 Mainframe Manual.

* -"Key" and "keyboard" represent the red, green, and yellow keys. "Push button" represents the black selector buttons.

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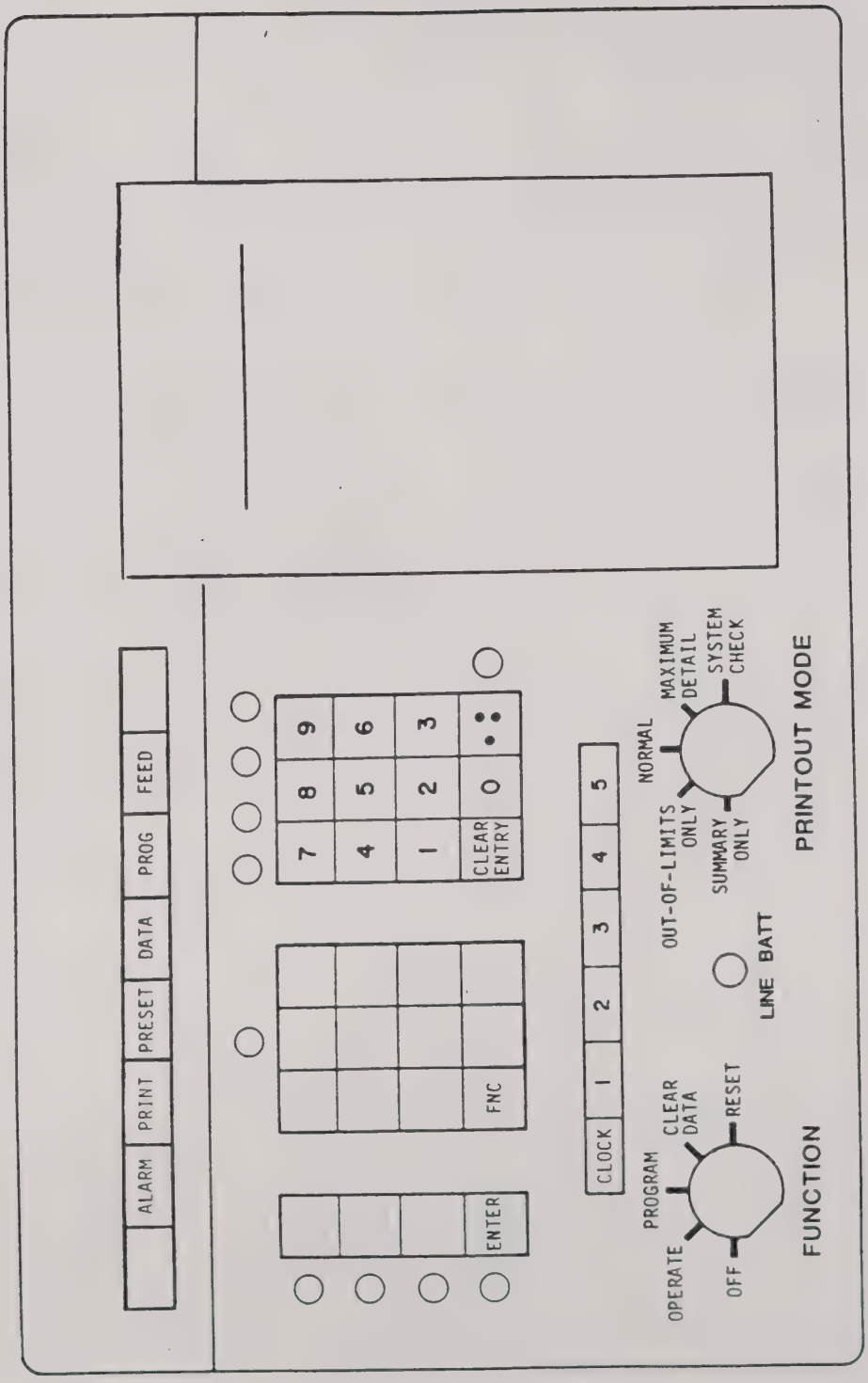

Figure 2-1. Series 626 Controls used by the 6012A Plug-in

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2.5 6012A PLUG-IN PROGRAMMING OPERATIONS AND FUNCTIONS

The 6012A plug-in allows four programming operations and functions while in the Program Mode. They are:

1. Programming the Telephone Number (PHONE #).
2. Programming the Transmit Mode (XMIT MODE).
3. Programming the 2-Digit Station ID Number (STATION ID).
4 Performing an Immediate Transmit of the Data in the Stack Memory (TRANSMIT).

2.5.1 Programming Procedure for the 6012A Plug-In

(1) Turn on the Series 626. Turn the FUNCTION key from the "OPERATE" position to the "PROGRAM" position.

NOTE

A slight delay of the Series 626 Power-On sequence occurs with the 6012A plug-in installed. The length of the delay depends on the value and number of digits in the programmed telephone number.

a. A Program Summary for the currently selected channel will be immediately printed.*

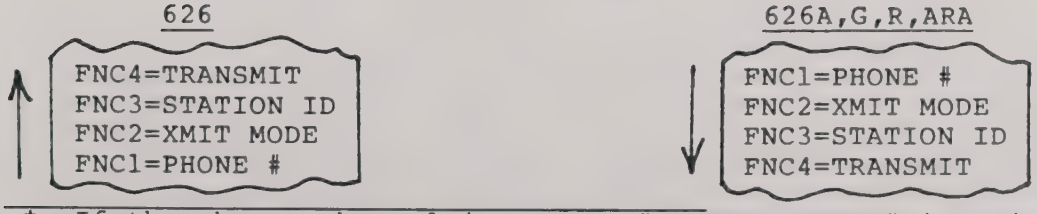
(2) Press the channel push button (one through five) corresponding to the slot position of the 6012A plug-in.

a. The channel's Program Summary is immediately printed.

NOTE

The "Factory Preset" program may be recalled at any time during the Program Mode. (Refer to subsection 2.5.2 for more information on the PRESET function.)

b. The red LED above the center bank of keys lights, and the following is printed:



* -If the chosen channel is empty, "CHANNEL EMPTY" is printed.

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NOTE

The parameters programmed under subsections 2.5.1.1 thru 2.5.1.4 do not have to be programmed in their given order. Use whatever order is appropriate for your specific situation when programming them.

2.5.1.1 Programming the Telephone Number (PHONE #)

a. The red LED above the center bank of keys should be lit.

(1) Press the red [FNC] key.*

(2) Press [1] to begin programming the telephone number.

a. Because FNC1=PHONE #. (See printout in subsection 2.5.1, step (2)b.)

b. The green LED next to the [ENTER] key lights, waiting for [ENTER] to be pressed.**

(3) Press [ENTER].

a. The green LED goes out and the following prompt message is printed:

b. Two yellow LEDs light, indicating that the number of digits in the telephone number, including the WAIT-FOR-DIAL-TONE characters, must now be entered. (If there are less than 10 digits, a leading zero must be entered.)

---

* -Numbers and letters shown in brackets "[]" in this manual stand for the individual red, green, and yellow keys.

** -Pressing [CLEAR ENTRY] before [ENTER] will clear the current sequence of numeric keys which have been pressed.

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NOTE

When programming the Series 626 from its front panel, if the 6012A plug-in is currently dialing a phone number, the phone number cannot be programmed and you will get a "PHONE STATUS BUSY" message. (2)

(4) Press the keys corresponding to the number of digits.

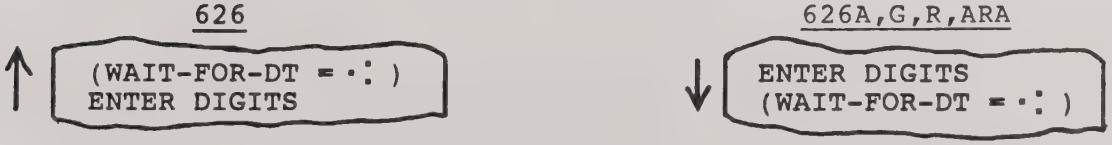
a. For Example: If you're dialing the telephone number 4 (wait-for-dial-tone) 555-1234, you would press:

[0] [9]

because there are eight numeric digits and one wait-for-dial-tone digit in the telephone number.

(5) Press [ENTER].

a. The following prompt is printed indicating that the actual telephone number digits must now be entered:



(1)

b. A single yellow LED lights.

(6) Enter the telephone number digits using the yellow numeric keyboard.

a. For Example: If you're dialing the telephone number 4 (wait-for-dial-tone) 555-1234, you would press:

[4], [·:·], [5], [5], [5], [1], [2], [3], [4]

in this order ⟶

NOTE

Pressing [CLEAR ENTRY] at any point during the key entry sequence will return the programming sequence to the level of step (4) above.

b. After the specified number of digits have been entered, the yellow LED goes out; the green LED lights.

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(7) Press [ENTER].

a. The new telephone number is now transferred into CMOS RAM and loaded into the dialer. A Program Summary showing the new telephone number is then printed, and the programming sequence returns to the level of subsection 2.5.1, step (2)b.

2.5.1.2 **Programming the Transmit Mode (XMIT MODE)**

a. The red LED above the center bank of keys should be lit.

(1) Press [FNC].

a. A single yellow LED lights.

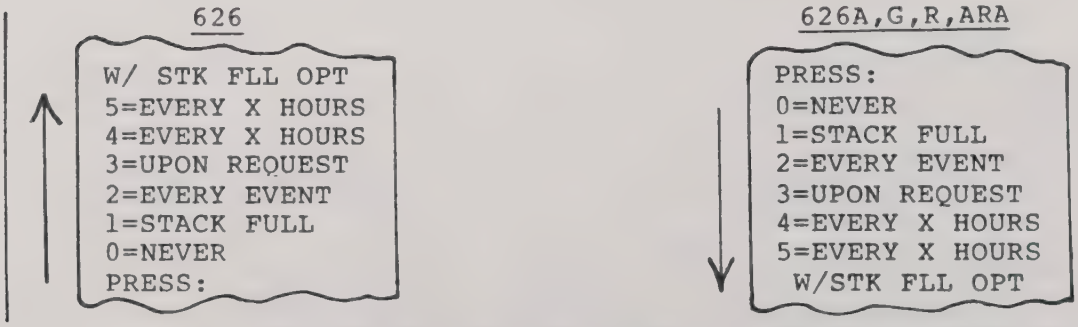
(2) Press [2].

a. Because FNC2=XMIT MODE.

b. The green LED lights.

(3) Press [ENTER].

a. The following list of Transmit Mode options is printed:



b. A single yellow LED lights, indicating that a digit, [0] through [5], must be pressed to enter your desired Transmit Mode.

(4) Press the key, [0] through [5], corresponding to the desired Transmit Mode.

a. If a [0] through [3] key is pressed, the programming sequence returns to the level of subsection 2.5.1, step (2)b without need for further entries, i.e., disregard step (5).

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(5) Enter the "hours" digits and press [ENTER]--if a [4] or [5] was previously pressed.

a. For Example: If your desired Transmit Mode is every eight hours, press [4] (because 4=EVERY X HOURS).

b. The green LED lights.

c. Press [ENTER].

d. The following is printed:

e. Two yellow LEDs light, indicating that the hours between transmissions must now be entered. The entered value may range from 01 to 99 hours (leading zeroes must be entered).

f. Enter the "hours" digits: [0] [8].

g. The green LED lights.

h. Press [ENTER].

i. The new programming is now stored in CMOS RAM. A new Program Summary showing the new program values is printed. The programming sequence returns to the level of subsection 2.5.1, step (2)b.

2.5.1.3 Programming the Station ID Number (STATION ID)

a. The red LED above the center bank of keys should be lit.

(1) Press [FNC].

a. A single yellow LED lights.

(2) Press [3].

a. Because FNC3=STATION ID.

b. The green LED lights.

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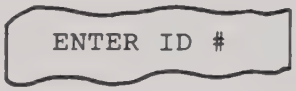
(3) Press [ENTER].

a. The following prompt is printed:



b. Two yellow LEDs light, indicating that the ID number, a value ranging from 00 to 99, must now be entered. (Leading zeroes must be entered.)

(4) Press the keys corresponding to the ID number.

a. For Example: To enter an ID number of 42, press the [4] and then [2] key.

(5) Press [ENTER].

a. The new ID number is stored in memory, an updated Program Summary is printed, and the programming sequence returns to the level of subsection 2.5.1, step (2)b.

2.5.1.4 Performing an Immediate Transmit of Data (TRANSMIT)

a. The Transmit Mode must be programmed to UPON REQUEST. Do this by repeating subsection 2.5.1.2 and selecting a [3] for the UPON REQUEST option of the Transmit Mode.

NOTE 1

If an Immediate Transmit is attempted while the Transmit Mode is not set to UPON REQUEST, the programming sequence will return immediately to the level of subsection 2.5.1, step (2)b.

NOTE 2

Changing the Transmit Mode clears any pending transmit requests (e.g., if the 6012A plug-in is trying to call but has not gotten through yet).

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b. The red LED above the center bank of keys should be lit.

(1) Press [FNC].

a. A single yellow LED lights.

(2) Press [4].

a. The green LED lights.

(3) Press [ENTER].

a. The following prompt message is printed:

626

```
IMMEDIATE XMIT
PRESS: 1=YES 0=NO
```

626A,G,R,ARA

```
PRESS: 1=YES 0=NO
IMMEDIATE XMIT
```

(4) Press [0] and [ENTER] to abort; press [1] and [ENTER] to confirm YES.

a. The printout in step (3)a is a confirmation step to safeguard against accidental transmissions which would result in the loss of data. If a [0] is pressed, followed by [ENTER], the immediate transmission sequence is aborted and the programming sequence returns to the level of subsection 2.5.1, step (2)b. If a [1] is pressed, followed by [ENTER], the immediate transmission sequence is initiated and the following message is printed:

```
! IMMEDIATE XMIT
```

A Program Summary is printed and the programming sequence returns to the level of subsection 2.5.1, step (2)b.

2.5.1.5 Completion of the Programming

When the 6012A plug-in's programming is completed, you may proceed to program another module, by pressing another channel push button, or place the Series 626 on-line by turning the FUNCTION key to the "OPERATE" position.

While on-line, you may obtain the program currently in effect by simply pressing the black [PROG] push button.

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2.5.2 Selecting the "Factory Preset" Program

To select the "Factory Preset" program proceed as follows:

(1) Turn the FUNCTION key to the "PROGRAM" position.

a. A Program Summary for the currently selected channel will be immediately printed.*

(2) Press the channel push button (one through five) corresponding to the slot position of the 6012A plug-in.

a. The channel's Program Summary is immediately printed.

b. The red LED above the center keyboard lights, and the following is printed:

(1)

626

```
FNC4=TRANSMIT
FNC3=STATION ID
FNC2=XMIT MODE
FNC1=PHONE #
```

626A,G,R,ARA

```
FNC1=PHONE #
FNC2=XMIT MODE
FNC3=STATION ID
FNC4=TRANSMIT
```

(3) Ignore this printout and press the black [PRESET] push button.

a. This recalls the "Factory Preset" program from memory.

b. A Program Summary indicating the PRESET values is printed, and the programming sequence returns to the level of Subsection 2.5.1, step (2)b.

c. An example of the "Factory Preset" printout is as follows:

(1)

626

```
UPON REQUEST
XMIT MODE:
238
PHONE NUMBER:
STATION ID # 00

   626-PA-6012A
```

626A,G,R,ARA

```
   626-PA-6012A

STATION ID # 00
PHONE NUMBER:
238
XMIT MODE:
UPON REQUEST
```

NOTE

(2) The "Factory Preset" program cannot be recalled while the 6012A plug-in is in the process of dialing (PHONE STATUS BUSY).

* -If the chosen channel is empty, "CHANNEL EMPTY" is printed.

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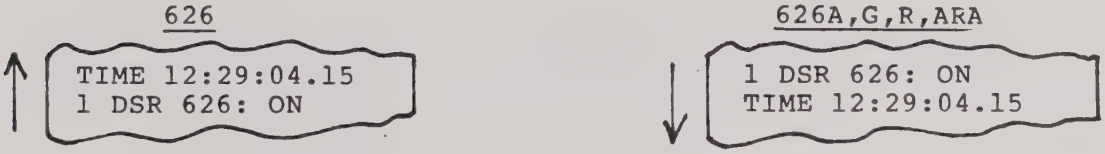
2.6 OPERATIONAL PRINTOUTS

This subsection contains information on obtaining an Operational Disturbance Printout, Data Summary Printout, and Short-Term Accumulator Printout.

2.6.1 Operational Disturbance Printout

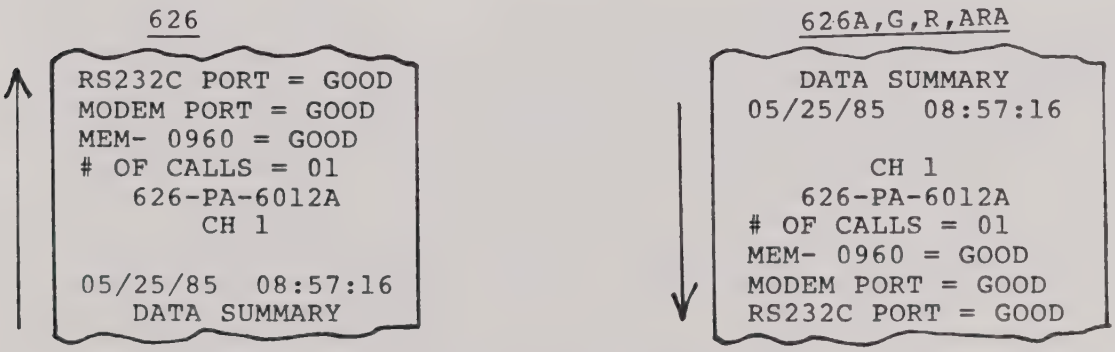
Any operational disturbances encountered by the 6012A plug-in are printed by the Series 626. These printouts are not affected by any of the various printout modes of the Series 626. The possible Operational Disturbance printouts are listed in Table 1-1, Roman Numeral VIII. A typical example is as follows:



2.6.2 Data Summary Printout

A Data Summary printout is requested by pressing the black [DATA] push button with the FUNCTION key in the "OPERATE" position. It will also be automatically printed each day at midnight (refer to TM-106650U for an explanation).

The Data Summary printout serves as a status check for the 6012A plug-in. The following is an example of a typical Data Summary printout:



2.6.3 Short-Term Accumulator's Printout

If disturbances occur at a faster rate than the Series 626 is capable of processing and printing, and if the Series 626's internal event stack memory overflows, then any subsequent events are stored in the Short-Term Accumulator (in summary form) until the overflow condition is cleared.

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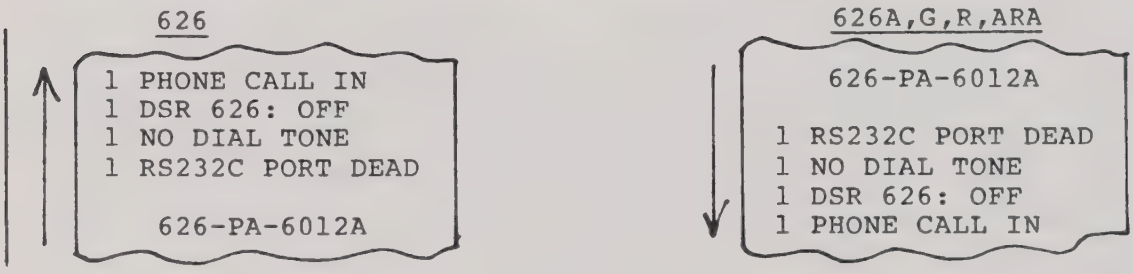
NOTE 1

The overflow problem may be avoided to some extent by setting the Series 626's baud rate to 9600 and turning off its printer. The 6012A plug-in will then collect up to 960 disturbance events.

NOTE 2

If the Series 626 is turned off, all of the disturbance data being held in the Series 626 and 6012A plug-in's memory is cleared.

These values are automatically cleared after the printout of the Short-Term Accumulator is completed. The event format is identical to the Operational Disturbance Printout, with the exception that no time information is printed. An example of a typical Short-Term Accumulator's printout is as follows:



2.7 EXAMPLE INSTALLATION

This subsection contains application information and describes a typical installation using, as an example, a UDS Model 103LP Modem at the user's end to communicate with a remote 6012A plug-in.

2.7.1 Calling the 6012A Plug-In

The following procedure "calls up" the 6012A plug-in.

2.7.1.1 Dialing

(1) Set the TTY or CRT to 300 baud.

(2) Connect the TTY or CRT to the modem's rear panel connector.

(3) Connect the telephone to the TELSET jack on the modem's rear panel, and the phone line to the TELCO jack.

(4) Set the modem's front panel switch to the "TALK" position, and the rear panel switch to the "ORIGINATE" position.

(5) Lift the telephone OFF-HOOK and dial the 6012A plug-in's telephone number.

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2.7.2 Log-On Procedure

(1) After the ringing stops (usually after 1 ring), listen for the Answer Back Tone (ABT); it should occur after the 2-second Billing Delay.

(2) Within 4 seconds of hearing the tone, set the modem's front panel switch to the "DATA" position.

(3) A "?" should appear after approximately 1 second; you now have 15 seconds to enter "IDXX": where XX is the Station ID number assigned to that particular 6012A plug-in.

NOTE

When attempting to access the 6012A plug-in from a remote location:

After successfully completing the log-on procedure (unit has responded with the "IDXX" message), if the memory is full, attempting to perform any operation other than a data dump of the 6012A plug-in, results in a "MEMORY FULL (¦)" message printed at the remote terminal. After the data is dumped and the RS-232C COMM PORT to the Series 626 is restored, all operations are again permitted. The display data character "¦" can be used to display stack data, however, the MEMORY FULL condition is still present.

(4) If the above steps are all properly executed, the 6012A plug-in will send "XX-READY"." At this time the data link is established. After placing the Series 626 in the Remote Mode, your TTY will operate as if it is directly connected to the Series 626's communications port. (Refer to TM-106650U for more information regarding the operation of the Series 626 from a remote terminal.

(5) Refer to subsection 1.6 for more information regarding the Data Transmission procedures of the 6012A plug-in.

2.7.3 Receiving a Call from the 6012A Plug-In

2.7.3.1 Call Reception

(1) Set the TTY or CRT to 300 baud.

(2) Connect the TTY or CRT to the modem's rear panel connector.

(3) Connect the telephone to the modem's rear panel TELSET jack, and the telephone line to the TELCO jack.

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(4) Set the modem's front panel switch to the "TALK" position, and the rear panel switch to the "ANSWER" position.

(5) When the telephone rings, lift it OFF-HOOK and set the modem's front panel switch to the "DATA" position.

(6) After a 2-second pause, the 6012A plug-in will send the "STATION#XX" identification message and begin transmitting data.

2.7.3.2 Data Transmission

This subsection briefly describes the Data Transmission procedure used by the 6012A plug-in. (For a more detailed description of the Data Transmission procedure, refer to subsections 1.6 through 1.6.5.)

(1) After the first 1K block (or partial block) of data is transmitted, the 6012A plug-in will wait for 10 seconds for:

a. Positive Acknowledge--ACK
(^F)-to terminate wait time.

b. Negative Acknowledge--NAK
(^U)-to re-transmit the block of data.

c. End of Transmission--EOT
(^D)-to terminate call.

If an ACK, NAK, or EOT is received by the 6012A plug-in, the proper action is immediately taken. If the 10-second wait time expires, the next block of data is then transmitted.

(2) When the last block of data has been sent, an "END OF XMIT" message is sent followed by a 10-second wait (for ACK, NAK, or EOT).

(3) If no re-transmission is requested, then the 6012A plug-in will send a "BYE" message and terminate the call.

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SECTION III
OPERATIONAL TEST

3.1 GENERAL

This section describes the procedure used for verifying the 6012A plug-in's operation.

3.2 MINIMUM PERFORMANCE CHECK

A System Check of the 6012A plug-in tests nearly all of its circuitry (memory, RS-232C port, and modem port status) and verifies that it is operating properly. To perform the System Check routine:

(1) Turn the PRINTOUT MODE key momentarily to the "SYSTEM CHECK" position, and then back to "NORMAL".

NOTE

On some older models of the Series 626's front panel, "SYSTEM CHECK" may instead read "CALIBRATE".

a. The following is performed:

First
To determine the size of the operational (RAM) memory, memory is swapped out, page by page, and a series of test characters are written in, read back, and then compared.

Second
The modem is checked by selecting a TEST line which "loops" the output of the modem transmitter back to the modem receiver just behind the OFF-HOOK switch. Another series of test characters are sent out, and then read back in. This is done to check for proper operation of the modem; however, it DOES NOT check for proper operation of the telephone line, telephone line interface, OFF-HOOK switch, or dialer circuitry.

If the modem was previously turned off for any reason, a successful completion of the System Check routine re-enables the modem. Any failure to successfully complete the System Check results in the modem being disabled and a "MODEM DEAD" message being printed.

Third
The status lines of the 6012A Plug-in's COMM PORT are checked for proper signal levels (status).

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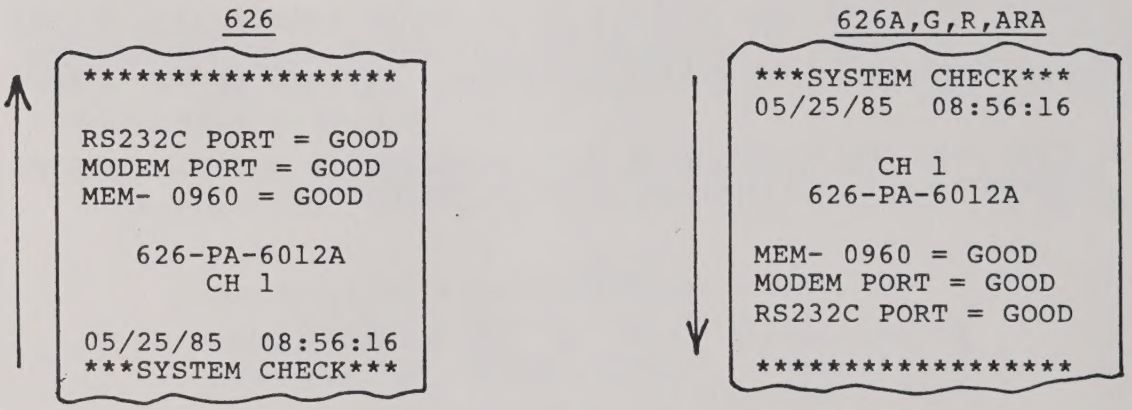
These procedures effectively test nearly all of the 6012A plug-in's circuitry (with the exception of the telephone line, telephone line interface, OFF-HOOK switch, and dialer circuitry).

3.3 SUCCESSFUL COMPLETION OF THE SYSTEM CHECK

Successful completion of the System Check results in a printout such as the following:



3.4 UNSUCCESSFUL COMPLETION OF THE SYSTEM CHECK

If your printout from the System Check routine does not read "GOOD" for all three readings, or if a "MODEM DEAD" message is printed during the System Check, contact the Dranetz Customer Service Department for further instructions (see subsection 1.9)

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